



Investigating mathematics teacher candidates' opinions about using information & communication technologies

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Abstract

As it has changed all fields in our lives, technological advancements have also improved education in such a large extent that integrating technology into education is inevitable. For this reason, teachers and teacher candidates are supposed to get acquainted with technology related information and skills. This study was conducted to determine the pre-service mathematics teachers' opinions about information and communication technologies. A questionnaire was applied to 104 mathematics teacher candidates from a university in the Black Sea Region as the data collecting tool. The data was analyzed with statistical software (SPSS 13.0) in terms of average mean, standard deviation and t-tests. Current findings show that mathematics teacher candidates have positive attitude towards applying ICT in classroom settings. Results show no significant difference between the attitudes and owning a computer, using the internet and the department being studied; however there is a significant correlation between attitudes and gender; favoring males.

Keywords: Information and Computer Technologies, Teacher Candidates

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1. INTRODUCTION

The present era requires accessing knowledge quickly and efficiently, whenever possible. In many countries, Information and Communication Technology (ICT) is becoming increasingly important (Smeets et al., 1999) and for the last decade, the impact of ICT on our daily lives has been steadily increasing. Technological innovations push educators wear different hats and the importance of technological applications in educational settings is solid. New technologies appear constantly, and it allows mere solutions to instructional problems. Technology has shaped the education in 21st century; nevertheless technological advancements should not aim to replace neither the teacher nor his/her role but should only divert teachers' role into being an expert (Smeets et al., 1999). Since the technological changes influences the teaching functions of teachers, it also becomes an issue.

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Consequently teachers that are already working in school systems and prospective teachers should acquire technological knowledge and skills (Akpınar, 2003). According to Heddens and Speer (1997) technology has also shaped teaching and learning process of mathematics like in many fields. It is widely accepted that mathematics teachers need to utilize technological means for increasing student attention and assisting their learning. The objective is to embed ICT into primary and secondary education, vocational training and adult education, as well as the teacher training colleges. In addition, higher vocational training and tertiary education at university level have received and ICT stimulus (Crowe & Zand, 2000).

Literature shows numerous studies on the integration of ICT into school systems and governments of developing and developed countries. Nevertheless studies that investigate the effects of ICT in improving mathematics education mainly argue that ICT utilization have not lived up to the expected standards (Aşkar, 2004). Studies have largely focused on ICT usage of teacher candidates and teacher candidate attitudes towards ICT. Herbert and Benbasat (1994) reported that 77% of the variance of intention to use ICT can be explained by attitude towards computers. It mainly depends on how positive the user's attitude is; rather than how planned or how organized the implementation is or how sophisticated the technology is (Liaw, 2007).

1.1. Review of the Literature

Cüre and Özden (2008) studied attitudes of teachers towards ICT with 163 teachers. Study showed positive teachers attitudes towards the use of information and communication technologies in education.

Umay (2004) investigated teachers and teacher candidates' opinions about application of Information Technologies. The study was conducted with 53 teacher candidates and 25 teachers. It was determined that teacher candidates do not include ICT in their lesson plans. Major reason was not being knowledgeable enough to use technology in lesson. It was followed by the consideration that lessons did not require any use of technology. There was also the anticipation that their employment locations (future schools) would not have the required technological infrastructure. When in-service teachers were observed, the situation was similar and sometimes even worse. It was discovered that many did not include any tools of Information Technology in their lesson plans. In the study concerning student views about the use of computers in mathematics classrooms, Vale and Leder (2004) determined a relation between student attitudes towards computer-based mathematics and their allover view of computers.

Shapka and Ferrari (2003) observed the computer-related attitudes of 56 secondary school and primary school pre-service teachers. For outcomes of a computer task and for computer attitudes; no gender differences were found. Schumacher and Martin (2001) investigated a relationship between internet and computer experiences, and skills and attitudes. Results showed a correlation between competence and comfort levels with the internet and computers and predicted internet skills and experiences.

As presented above, various studies reported that teachers and pre-service teachers do not use instructional technologies properly in their instruction. Current study investigates whether the situation is similar in Turkey. In this context, it sounds meaningful to investigate mathematics teachers' and pre-service mathematics teachers' ICT application levels through the instructional process.

1.2. The Aim of the Study and Research Problems

Fast advancing technology effects education. It is obvious that teacher candidates' attitudes towards ICT have part on efficient application of ICT in educational settings. The research aims at identifying the level of the mathematics teacher candidates' attitudes towards using ICT. To illuminate this issue following research problems were constructed:

1. What is the level of mathematics teacher candidates' attitude towards ICT?
2. Is there a significant difference between mathematics teacher candidates' attitude scores towards ICT and gender?
3. Is there a significant difference between mathematics teacher candidates' attitude scores towards ICT and the departments they are in?
4. Is there a significant difference between their attitude scores towards ICT and owning a computer and using internet?

2. METHOD

2.1. Research Design

This is a case study under the main title of descriptive approach that looks into a particular university and goal is to determine the attitudes of mathematics teacher candidates towards using ICT in lectures. Case studies facilitate deep and detailed examination of the issue of concern. They also give opportunity to draw relations among data and to conclude reason result relationships. This method was selected because the method is particularly suitable for studies conducted individually and it enables examining one aspect of the problem thoroughly in a short time (Çepni, 2007; Yin, 2003).

2.2. Sample

The participants of the study was composed of 58 male (55.8%) and 46 female (44.2%), totaling 104 pre-service mathematics teachers from a university in the Black Sea region in Turkey. 57 of these teachers were primary and 47 of them were the secondary school mathematics teachers.

2.3. Data Gathering and Analysis

A questionnaire with two parts was developed by the authors. The first part asks about personal information, computer and internet using states. The second part is a 52-item, 5-point likert scale to evaluate pre-service mathematics teacher attitudes towards ICT.

For forming the items ICT literature was reviewed (Albirini, 2006; Çavaş, Çavaş, Karaoğlu & Kışla, 2009; Frantom, Green & Hoffman, 2002; Kısa & Kaya, 2006; Simsek, 2008). 45 mathematics teacher candidates who were at the faculty of education secondary school science and mathematics field education department were asked to write an article about their feelings and thoughts related to computers and technology. The articles were examined and objected to a content analysis. Then, 57 items were determined based on the related literature and the articles. Concerning the review by researches and evaluation of experts some expressions were corrected and 5 items excluded. After this correction, 52 items remained. Excluding the article writers, the draft scale was applied twice, two weeks between each, to 47 mathematics teacher candidates who were at the last year (5th year) of

faculty of education secondary school science and mathematics field education department and the correlation coefficient was calculated 0,88.

The choices degreed as: “strongly agree”, “agree”, “neither agree nor disagree”, “disagree”, “strongly disagree”. Teacher candidates were asked to choose the choices that fit them best. Scoring was calculated by attaining 5 points for strongly agree choices, 4 points for agree, 3 for neither agree nor disagree, 2 for disagree, and 1 for strongly disagree. Scoring was inverted for items with negative statements. The higher scale score corresponds to the more positive attitude towards ICT applications.

The part that looked for the use of ICT have items like “Using ICT makes instruction less boring”, “I think that using ICT in instruction causes waste of time”, “I am planning to use instruction materials in my lessons when I become a teacher”, “I am planning to exchange ideas with my colleagues utilizing ICT in virtual media or real life situations”, “I like to use ICT”. To determine the questionnaire reliability, Cronbach Alpha was calculated and reported as 0,71. Statistical analysis was carried out by SPSS 13. Statistical analyses techniques such as arithmetic mean, frequency, standard deviation and t-test was used in the data analysis.

3. FINDINGS AND DISCUSSION

3.1. What is the Level of Mathematics Teacher Candidates’ Attitude Towards ICT?

As it is presented in Table 1 average attitude scores of mathematics teacher candidates to ICT was figured out 130.96 out of 260. The result of the study (Deniz, Görgen & Şeker, 2006; Jimoyiannis and Komis, 2007; Kışla, Çavaş, Çavaş & Karaoğlu, 2008) show that teacher candidates have positive attitude towards ICT agrees with our results. Cüre and Özden (2008) also agreed that teachers seem to have positive attitudes towards technology. It can be said that the main reasons for this is mathematics teacher candidates’ increasing opportunities of using computers in their daily life and faculties of education.

Table 1. Distribution of Mathematics Teacher Candidates’ Attitudes Towards ICT

Attitudes towards using ICT	N	\bar{X}	SD
Mathematics teacher candidates	104	130.96	10.34

3.2. Is There a Significant Difference Between Mathematics Teacher Candidates’ Attitude Scores Towards ICT and Gender?

An independent t-test was applied to determine whether there is a gender based difference on ICT attitude scores. The results of the test are demonstrated in Table 2.

Table 2. t-test Results Showing Variance of Teacher Candidates’ Attitudes Caused by Gender

Gender	N	\bar{X}	SD	DF	T	P
Male	58	133.51	10.63	102	2.93	.004
Female	46	127.74	9.06			

As it is seen in Table 2, the average ICT attitude scores of male and female candidate teachers were 133.51 and 127.74 respectively. This means that there is a significant difference between ICT attitude

scores of male teacher candidates and female ones [$t_{(102)}=2.93$, $p<.05$]. This finding implies that male teachers possess more positive attitudes towards ICT than female counterparts. The finding about the relations between the gender and the attitudes toward ICT agrees with Young (2001)'s findings, although it contradicts the results of Shapka and Ferrari (2003).

There have been different results in the literature about the effect of gender on attitude towards computers and technology. Numerous studies have indicated these gender differences in ICT attitudes, whereby males hold more positive attitudes than females (Broos, 2005; Ocak, 2005; Schumacher & Martin, 2001). Comber, Colley, Hargreaves and Dorn (1997), for instance, reported a more positive attitude toward computers for boys than for girls. It is specified in some studies that there is not a significant difference on teacher candidates' attitudes towards technology according to gender (Deniz et. al., 2006; Littleton & Light, 2004; Oosterwegel, Shapka & Ferrari, 2003). This situation can be explained as gender on attitudes towards computer and technology is not an effective factor.

3.3. Is There a Significant Difference Between Mathematics Teacher Candidates' Attitude Scores Towards ICT and the Departments They are in?

T- test results investigating whether there is a department bound difference on ICT attitude scores are presented in Table 3 below.

Table 3. T-test Results of the Variance on ICT Attitude Scores Depending on Teacher Candidates' Departments

Department	N	\bar{X}	SD	DF	T	P
Primary School	57	131.45	10.26	102	.54	.593
Secondary School	47	130.36	10.50			

As it can be seen from the table average ICT attitude score of teacher candidates from primary school mathematics education department is 131.45 and for secondary school education department it is 130.36. This is not a statistically significant difference [$t_{(102)}= .54$, $p>.05$]. This finding shows that ICT attitudes of teacher candidates from primary and secondary school education department are similar.

3.4. Is There a Significant Difference Between Mathematics Teacher Candidates' Attitude Scores Towards ICT and Owning a Computer and Using Internet?

The t-test results to determine whether "owning a computer" and "using the internet" variables have effect on ICT attitude scores are tabulated in Table 4.

Table 4. t-Test Results Presenting the Effects of "Owning a Computer" and "Using the Internet" on ITC Attitude Scores

Variable		N	\bar{X}	SD	DF	T	P
Owning a computer	Yes	63	131.66	9.56	102	-.86	.391
	No	41	129.88	11.47			
Using the internet	Yes	86	131.35	10.53	102	-.83	.406
	No	18	129.11	9.35			

As it is presented in Table 4, no significant differences between the ICT attitude scores of the ones who own computers ($\bar{x}=131.66$) and the ones with no computers ($\bar{x}=129.88$) [$t_{(102)} = -.86$, $p>.05$] and between the ICT scores of internet users ($\bar{x}=131.35$) and those who do not use the internet ($\bar{x}=129.11$) [$t_{(102)} = -.83$, $p>.01$] were found. Nevertheless this finding shows that teacher candidates having computers have more positive attitude to ICT than teachers not having computers and in the same way internet users have more positive attitudes than teachers not using the internet. Similarly Kışla et al. (2008) saying internet using teachers with e-mail addresses have more positive attitudes. The results are parallel to the findings of Schumacher and Martin (2001); that there is a significant correlation between internet and computer experience and attitude.

4. CONCLUSION AND SUGGESTIONS

This study was conducted to determine pre-service mathematics teachers' attitudes towards using ICT. The study came up with the result that pre-service mathematics teachers have rather positive attitudes towards using ICT. This result is parallel with the studies of Cüre and Özdener (2008) and Mahmood (2009). Cüre and Özdener (2008) found that teachers' general attitude towards use of ICT in education was positive. Similarly Mahmood (2009) revealed that overall attitudes of the students were positive. Additionally, it was determined that there were no significant differences between pre-service mathematics teachers' attitudes towards using ICT and owning a computer, using the internet and departments that the pre-service teachers study at. Contrary to this Teo (2008) found significant differences between students who own computers at home and who do not. And Sipila (2010) revealed that teachers who used personal laptops in their work regarded the use of ICTs more positively than teachers who did not. One sub-problem investigated whether there was a difference between male and female mathematics teacher candidates' average attitude scores towards using ICT and it was determined that there is a significant difference between the groups in favor of the males.

In this study, pre-service mathematics teachers' opinions about using ICT were collected. Future studies may pick up teachers' and lecturers' opinions and a comparison can be made. By increasing the sample size, cross-departmental comparison can be investigated for pre-service teachers. Developing scales with high reliability and validity scores can be another contribution to the field in terms of ICT usage of teachers and teachers.

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